

WHAT IS CLAIMED IS:

1. A filter processing apparatus comprising:

first filter processing means for performing
filter processing on image data and outputting 2 types
5 of data obtained by the processing as 1 pair of data;

data rotation means for rearranging the data
outputted from said first filter processing means by
rotating the data by 90° by 2 pairs and outputting the
data; and

10 second filtering means for performing filter
processing on the image data rearranged by said data
rotation means and outputting 2 types of data obtained
by the processing as 1 pair of data.

15 2. The filter processing apparatus according to claim 1,
wherein said first and second filtering means perform
forward wavelet transform processing, and wherein the 2
types of data included in said 1 pair of data are a
high-frequency transform coefficient and a low-frequency
20 transform coefficient.

3. The filter processing apparatus according to claim 1,
wherein said first and second filter processing means
perform inverse wavelet transform processing, and input
25 and process 1 pair of data including a high-frequency
transform coefficient and a low-frequency transform
coefficient.

4. The filter processing apparatus according to claim 1,
wherein image data for 2 pixels arrayed in a vertical
direction are inputted in parallel as the 1 pair of data.

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5. The filter processing apparatus according to claim 4,
wherein said first filter processing means performs
vertical filter processing, and wherein said second
filter processing means performs horizontal filter
processing.

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6. The filter processing apparatus according to claim 4,
further comprising input data rotation means, provided
in a previous stage of said first filter processing
means, for rearranging input image data by rotating the
data by 90° by 2 pairs and outputting the data,

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wherein said first filter means performs
horizontal filter processing, and wherein said second
filter means performs vertical filter processing.

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7. The filter processing apparatus according to claim 1,
wherein said first filter process means is an FIR filter.

8. The filter processing apparatus according to claim 7,
further comprising input means for inputting image data
in 2 line units into said first filter process means,

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wherein said input means inputs the image data by

alternate lines for pixels necessary for the processing by said first filter processing.

9. A filter processing apparatus comprising:

- 5 first filter processing means for performing filter processing on image data and outputting 2 types of data obtained by the processing as 1 pair of data; storage means for temporarily storing the data outputted from said first filter process means by each
- 10 type, and alternately outputting each type of data for 2 pixels arrayed in a vertical direction as 1 pair; and second filter processing means for performing filter processing on the data outputted from said storage means and outputting 2 types of data obtained by
- 15 the processing as 1 pair of data.

10. The filter processing apparatus according to claim 9, wherein said first and second filter processing means perform forward wavelet transform processing, and
- 20 wherein the 2 types of data included in said 1 pair of data are a high-frequency transform coefficient and a low-frequency transform coefficient.

11. The filter processing apparatus according to claim 9,
- 25 wherein said first and second filter processing means perform inverse wavelet transform processing, and wherein the 2 types of data included in said 1 pair of

data are a high-frequency transform coefficient and a low-frequency transform coefficient]input and process 1 pair of data including a high-frequency transform coefficient and a low-frequency transform coefficient.

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12. The filter processing apparatus according to claim 9, wherein said first filter process means is an FIR filter.

10 13. The filter processing apparatus according to claim 9, wherein said first filter processing means performs horizontal filter processing, and wherein said second filter processing means performs vertical filter processing.

15 14. A filter processing apparatus comprising:

filter processing means for performing filter processing on image data while selecting a first mode or a second mode, and outputting 2 type of data obtained by the processing as 1 pair of data;

20 data rotation means for rearranging 2 pairs of data outputted from said filter process means by rotating the data by 90° and outputting the data; and

first selection means for selecting image data inputted from outside or the image data rearranged by
25 said data rotation means, and inputting selected image data to said filter process means,

wherein if said first selection means selects the

image data inputted from the outside, said filter
process means performs the filter processing in the
first mode, while if said first selection means selects
the image data inputted from said data rotation means,
5 aid filter process means performs the filter processing
in the second mode.

15. The filter processing apparatus according to claim
14, further comprising second selection means for
10 selectively outputting the data outputted from said
filter process means to said data rotation means or the
outside.

16. The filter processing apparatus according to claim
15 14, wherein in said first mode, said filter process
means performs horizontal filter processing, while in
said second mode, said filter process means performs
vertical filter processing.

20 17. A filter processing apparatus for performing two-
dimensional filter processing on two-dimensional digital
data, comprising:

a calculation unit having a multiplier and an
adder for filter calculation processing, horizontal
25 delay means and vertical delay means having different
delay amounts corresponding to horizontal and vertical
directions,

wherein outputs from said horizontal and vertical delay means or contents of calculation by said calculation unit are selected at predetermined cycles, and wherein output data from each calculation unit are re-inputted at least once to the same calculation unit and processed in said unit.

18. The filter processing apparatus according to claim 17, wherein said filter processing is wavelet transform.

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19. The filter processing apparatus according to claim 18, wherein plural calculation units are serially connected, and wherein an output from a last calculation unit is outputted as filter processed data, further wherein the output data are rotated in 2x2 units, further wherein the rotated data are re-inputted into an initial calculation unit.

20. The filter processing apparatus according to claim 17, wherein the multiplier in said calculation unit selects one of plural multiplication coefficients, and wherein the multiplier selects one of the multiplication coefficients at every circulation of processed data.

21. The filter processing apparatus according to claim 17, wherein a period of selection between the outputs from said horizontal and vertical delay means and the

contents of calculation by said calculation unit is
shorter than a period in which all the contents held by
said vertical delay means is updated with new contents.